

## CLAIMS

- 1 1. A digital control system for voltage converters, comprising:
  - 2 an oscillator that issues a pulse;
  - 3 a duty cycle generator, wherein the pulse is used to load a numerical value stored in a
  - 4 memory of the system into the duty cycle generator;
  - 5 a digital counter that stores and alters a duty cycle;
  - 6 a first comparator that determines how the duty cycle must be modified; and
  - 7 an algorithm generator producing an algorithm that determines the rate of change of the
  - 8 duty cycle.
- 1 2. The system of claim 1 wherein if the comparator detects that an output voltage is higher
  - 2 than a reference voltage, the comparator retards the issuance of the pulse in a cyclical fashion,
  - 3 thereby creating a burst of pulses with a desired duty cycle.
- 1 3. The system of claim 2 further comprising a second comparator having a reference
  - 2 different than the first comparator.
- 1 4. A method for producing a desired output voltage comprising:
  - 2 storing in memory, an indication of a pulse duty cycle needed for a varying load;
  - 3 monitoring the load;
  - 4 altering the stored duty cycle at a first frequency to produce the desired output voltage
  - 5 based upon the indication; and
  - 6 if a change in the load is detected, changing the frequency of alteration of the duty cycle.

- 1 5. The method of claim 4 wherein the indication comprises a digital counter, and wherein  
2 changing the frequency of alteration of the duty cycle comprises changing the frequency of  
3 updating the digital counter.
- 1 6. The method of claim 4 wherein monitoring the load comprises usage of two or more  
2 comparators.
- 1 7. The method of claim 4, wherein if the load increases, the frequency of alteration is  
2 increased, thereby minimizing a dip in the output voltage.
- 1 8. The method of claim 6, wherein the two or more comparators each have a different  
2 reference.
- 1 9. A voltage converter that produces an output voltage, comprising:  
2 a digital controller that controls the output voltage of analog circuitry;  
3 a numerical value stored in a memory of the converter;  
4 a duty cycle generator that utilizes the numerical value to alter the duty cycle of the  
5 analog circuitry;  
6 a first comparator that compares the output voltage to a reference voltage at a first rate;  
7 and  
8 a second comparator that compares the output voltage to the reference voltage at a second  
9 rate,  
10 wherein the numerical value is updated based upon a comparison at the first or second  
11 rate.
- 1 10. The voltage converter of claim 9 further comprising an algorithm generator that selects  
2 the speed that the numerical value is updated.

- 1 11. The voltage converter of claim 9 wherein the digital controller selects either the first or  
2 second rate.
- 1 12. The voltage converter of claim 9 wherein when either comparator detects that the output  
2 voltage is higher than the reference voltage it decreases the duty cycle.
- 1 13. The voltage converter of claim 9 wherein when either comparator detects that the output  
2 voltage is lower than the reference voltage it increases the duty cycle.
- 1 14. The voltage converter of claim 9 wherein the numerical value is stored in an up-down  
2 counter in the memory, and wherein if either comparator detects that the output is lower than the  
3 reference voltage it switches the up-down counter in up mode, and if the reference voltage is  
4 lower, it switches the up-down counter in down mode.
- 1 15. A method for bucking or boosting a voltage, comprising:  
2 providing groups of pulses, each group comprising one or more pulses;  
3 detecting the rate of change of an output voltage over time;  
4 modifying the frequency of generation of the groups of pulses in response to said rate of  
5 change;  
6 detecting the magnitude of the output voltage; and  
7 changing a pulse width of the output voltage in response to the detected magnitude.
- 1 16. A digital controller of a voltage regulator, comprising:  
2 an up/down counter that stores a numerical value used to alter a duty cycle of the  
3 controller driving a transistor/switch;  
4 a duty cycle generator that utilizes the numerical value to alter the duty cycle; and

- 5            an algorithm generator that produces an algorithm that alters the rate of change of the
- 6    duty cycle.